

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**



(19)

Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 522 756 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention  
of the grant of the patent:  
31.01.1996 Bulletin 1996/05

(51) Int. Cl.<sup>6</sup>: A61K 7/48, A61K 7/04,  
C11D 3/37

(21) Application number: 92305922.4

(22) Date of filing: 26.06.1992

(54) **Ampholyte terpolymers providing superior conditioning properties in skin and nail care products**

Ampholitische Terpolymere mit verbesserten Konditionierungseigenschaften in Shampoozusammensetzungen und Haarpflegemitteln

Terpolymères ampholyte avec des propriétés de conditionnement supérieur employer dans des shampoings et d'autres produits pour les soins des cheveux

(84) Designated Contracting States:  
AT BE CH DE DK ES FR GB GR IT LI LU NL PT SE

• Vaughan, Craig W.  
Freedom, PA 150542 (US)  
• Melby, Allen L.  
Zelienople, PA 16063 (US)

(30) Priority: 28.06.1991 US 723003  
17.06.1992 US 896637

(74) Representative: Nash, David Allan et al  
London WC2A 1AT (GB)

(43) Date of publication of application:  
13.01.1993 Bulletin 1993/02

(56) References cited:

EP-A- 0 266 111	EP-A- 0 308 221
WO-A-86/05391	US-A- 4 401 650
US-A- 4 528 111	US-A- 4 806 345

(73) Proprietor: Calgon Corporation  
Pittsburgh, Pennsylvania (US)

Remarks:

The file contains technical information submitted  
after the application was filed and not included in this  
specification

(72) Inventors:

- Shih-Ruey, Thomas  
Pittsburgh PA 15237 (US)
- Matz, Gary F.  
Carnegie, PA 15106 (US)

EP 0 522 756 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

**Description****BACKGROUND OF THE INVENTION**

## 5    1. Field of the Invention

The present invention relates to compositions and methods for treating the skin and nails in which a cosmetically acceptable medium is used which contains from 0.1-10% by weight of an ampholyte terpolymer.

The surface properties of human skin and nails are, of course, of basic interest in cosmetic science; and there has 10 thus been a long-standing desire to discover ingredients which will beneficially affect the topical condition of this keratinous substrate. Skin conditioning products are desired which will function to improve such properties as retention of skin moisture, softening of the skin, attraction of air moisture, retardation of skin water loss, feel and reduction of skin irritations caused by contact with detergents, soaps and the like.

In this field, two broad areas of skin care products have been recognized as skin conditioners: emollients and humectants. 15 Emollients function to provide improved moisture retention in the skin and plasticization/softening of the skin. Common commercial emollients are mineral oil; petrolatum; aliphatic alcohols, such as stearyl alcohol; lanolin and its derivatives; glycol stearate; and fatty acids, such as triethanolamine oleate. Humectants function to attract moisture, retard evaporation of water from the skin surface, and plasticize/soften skin. Common commercial humectants are glycerin, propylene glycol, sorbitols, and polyethylene glycols.

20    A desirable skin conditioner should impart all or some of the attributes of an emollient and a humectant, as well as provide improved lubricity and feel to the skin after treatment and/or reduce skin irritation caused by other components in the conditioner such as soaps, detergents, foam boosters, surfactants, perfumes and the like. Recently, cationic polymers have been used as skin conditioners.

Sometimes, it is also desirable that the ingredients of skin and nail care products will have adequate adherent 25 properties, so that they are not only adsorbed initially, but are also retained on exposure to water. This property is referred to as "substantivity", i.e., the ability of a material to be adsorbed onto the keratin of the skin and nails and to resist removal by water rinse-off.

As indicated, human skin and nails are composed of keratin, a sulfur-containing fibrous protein. The isoelectric point of keratin, and thus of the hair of which it is composed, is in the pH range of 3.2-4. Thus, at the pH of typical use conditions, 30 the human skin and nails carry a net negative charge. Consequently, cationic polymers have long been used as conditioners in nail and skin care formulations. The substantivity of the cationic polymers for negatively charged skin and nails leads to film formation that facilitates lubricity, moisturizing and feel. Two commercially used cationic polymers are Merquat 550 (Calgon), a copolymer of acrylamide and dimethyldiallyl ammonium chloride, and polymer JR (Union Carbide), a quaternary nitrogen-containing hydroxyethyl cellulose.

35    It is a feature of the ampholyte terpolymers of the present invention that by varying the molar amounts and/or types of cationic components of the overall terpolymer, it is possible to adjust the cationic nature of the amphoteric polymer. By altering the mole percent charge, distribution of the cationic charge on the polymer backbone, and distance from the backbone (side chain length), one can achieve variations in the lubricity, moisturizing and feel of the resulting ampholyte terpolymer.

40    When cationic polymers are added to skin care products which are cleaning composition, e.g., dishwashing liquids, that contain anionic surfactants, formation of highly surface active association complexes takes place which imparts improved foam stability to the product. Maximum surface activity and foam stability, or lather, are achieved at near stoichiometric ratios of anionic surfactant:cationic polymer, where the complex is least water soluble. All cationic conditioners exhibit some incompatibility at some of these ratios. While compatibility gives clear formulations, where that is desired, 45 a certain amount of incompatibility is also acceptable.

The skin and nail conditioning properties of lubricity, moisturizing and feel are related to the film forming properties of the cationic monomers, as well as to molecular weight, with performance increasing with increasing molecular weight.

The ampholyte terpolymers of the present invention give one the ability, by varying the proportions and individual character of the nonionic, cationic and anionic components, to balance the hydrophobic and hydrophilic characteristics 50 of the overall ampholyte terpolymer, thereby permitting one to optimize the conditioning properties of the final product.

It is also possible, by varying the types and proportions of the nonionic, cationic and anionic components, especially the anionic components, of the ampholyte terpolymers of the present invention, to be able to adjust the acidic nature, e.g., the  $pK_a$ , of the anionic component of those terpolymers so as to more closely adjust the intrapolymer and polymer/skin and nail interactions, and thereby favorably affect the resulting conditioning properties.

55    While all of the conditioning property improvements described above are applicable primarily to skin care, human nail care products will also benefit from the improvement in conditioning properties afforded by the ampholyte terpolymers of the present invention. In addition, fragile or brittle nails will be strengthened or hardened, and the appearance of the nails will be improved as a result of use of the ampholyte terpolymers of the present invention.

Thus, overall the amphotolyte terpolymers of the present invention are believed to constitute a significant improvement in the skin and nail conditioning art because, when contrasted to the products heretofore used in the art, they exhibit a superior combination of skin and nail care properties. These properties include improved moisture retention, and improved lubricity and feel of the skin and nails during and after treatment.

5

## 2. Brief Description of the Prior Art

Heretofore, skin and nail conditioning additives have been largely of three different types: cationic polymers, proteins or protein derivatives, and fatty quaternary ammonium compounds. Commonly used cationic polymers include: quaternary nitrogen-containing hydroxyethyl cellulose compounds, copolymers of vinylpyrrolidone and dimethylaminoethyl-methacrylate, and amino functional polydimethylsiloxane. Hydrolyzed animal protein has been frequently used as a skin conditioner. Also used are natural products such as collagen and casein. Suitable quaternary ammonium compounds include such products as stearyl dimethyl ammonium chloride.

10

Conditioning additives comprising copolymers of dimethyldiallylammonium chloride and other monomers are well known; see, e.g., EP-A-0 308 189 (with acrylamide); and EP-A-0 308 190 (with hydroxyethyl cellulose). The use of such polymers in cosmetics is also described in Sykes et al., *Drug Cosmet. Ind.*, 126(2), 62, 64, 66, 68, 136 (1980). Amphoteric betaines have also been employed in cosmetic compositions; see GB 2,113,245 which discloses use of betainized dialkylaminoalkyl(meth)acrylate together with a cationic polymer. EP-A-0 227 321 discloses copolymers of saccharides with cationic monomers used in making a mild soap bar.

15

While the use of various combinations of cationic, anionic and/or nonionic polymers as additives for hair, skin and nail conditioning compositions has been suggested heretofore, there has been no appreciation that a significant improvement in all of the desired conditioning properties could be obtained by employing an amphotolyte terpolymer of the type used in the compositions and methods of the present invention.

20

For example, US 4,859,458 discloses hair conditioning polymers containing alkoxylated nitrogen salts of sulfonic acid which may also include additional monomers that may be neutral, anionic and/or cationic. While these include acrylamide, acrylic acid and dimethyldiallylammonium chloride, there is no suggestion of the amphotolyte terpolymers of the present invention.

25

EP 0 353 987 discloses polymers for water-rinsable personal care products, comprising a cationic monomer including dimethyldiallylammonium chloride, a monomer that carries a pendant group  $A_nR$  where  $n$  is 0 or a positive integer,  $A$  is ethyleneoxy and  $R$  is a hydrocarbyl group of 8 to 30 carbon atoms, and optionally a nonionic and/or an anionic monomer. However, there is no suggestion of the amphotolyte terpolymers of the present invention.

US 4,710,374 discloses cosmetic compositions comprising a cationic polymer including poly(dimethyldiallylammonium chloride), and an anionic latex, but there is no suggestion of the amphotolyte terpolymers of the present invention.

30

US 4,842,849 discloses compositions suitable for treating the hair, skin and nails comprising at least one cationic polymer including poly(dimethyldiallylammonium chloride), and at least one anionic polymer containing vinylsulfonic groups, optionally copolymerized with acrylamide. The cationic polymer may be an amphoteric polymer as defined, but none of these combinations suggest the amphotolyte terpolymers of the present invention.

35

EP 0 080 976 discloses aqueous hair-cosmetic compositions containing a surface active polymeric acrylic-based quaternary ammonium salt, a monomeric or oligomeric ammonium salt, and a surface active nonionic, anionic or zwitterionic component. The amphotolyte terpolymers of the present invention are not suggested.

US 4,128,631 discloses a method of imparting lubricity to keratinous substrates such as skin or hair by contacting said substrates with a salt of 2-acrylamido-2-methylpropane sulfonic acid (AMPSA) having a molecular weight of from 1-5 million. See also US 4,065,422. The amphotolyte terpolymers of the present invention and their unexpected advantageous properties are not suggested.

40

The amphotolyte terpolymers of the present invention are regarded as novel compositions of matter because of their unique properties, and their use as skin and nail conditioning additives has not heretofore been suggested.

Terpolymers of acrylamide/dimethyldiallylammonium chloride/acrylic acid are disclosed in US 4,455,240; 4,460,477; 4,484,631; and 4,533,708; however, nowhere is there a suggestion that those terpolymers might be used as conditioning additives for hair products.

45

A graft copolymer of acrylamide/acrylic acid/amylopectin/dimethyldiallylammonium chloride is disclosed in US 4,131,576, but is only suggested for use as a pigment retention agent in papermaking.

50

The amphotolyte terpolymers of the present invention represent a significant advance in the state of the skin and nail conditioning art and afford properties which are a surprising improvement over those possessed by the conditioning additives in the prior art described above. In contrast to such additives, the amphotolyte terpolymers of the present invention provide either an optimized combination of all conditioning properties, or else an optimized subset of such properties, which include: nail strengthening and appearance improvement, retention of skin moisture, softening of the skin, attraction of air moisture, retardation of skin water loss, feel and reduction of skin irritations caused by contact with detergents, soaps and the like.

SUMMARY OF THE INVENTION

5 The present invention relates to a composition for treating human skin and nails in which a cosmetically acceptable medium is used which contains from 0.1-10% by weight of an ampholyte terpolymer having a weight average molecular weight of from about 10 thousand to 10 million, comprising (a) from at least 1 to as much as 95 weight percent of a nonionic monomer, (b) from at least 5 to as much as 80 weight percent of a cationic monomer, and (c) from at least 1 to as much as 75 weight percent of an anionic monomer.

10 In a preferred embodiment, the nonionic monomer component of the ampholyte terpolymer in the composition for treating human skin and nails is acrylamide or derivative thereof as defined hereafter; the cationic monomer component is a diallylamine derivative as defined hereafter; and the anionic derivative is acrylic acid or derivative thereof, as defined hereafter.

15 The present invention also relates to a method of treating human skin and nails which comprises applying to said skin and nails a cosmetically acceptable medium containing from 0.1-10% by weight of an ampholyte terpolymer having a weight average molecular weight of from about 10 thousand to 10 million, comprising (a) from at least 1 to as much as 95 weight percent of a nonionic monomer, (b) from at least 5 to as much as 80 weight percent of a cationic monomer, and (c) from at least 1 to as much as 75 weight percent of an anionic monomer.

20 In a preferred embodiment, the nonionic monomer component of the ampholyte terpolymer contained in the cosmetically acceptable medium used in treating human skin and nails is acrylamide or derivative thereof as defined hereafter; the cationic monomer component is a diallylamine derivative as defined hereafter; and the anionic derivative is acrylic acid or derivative thereof, as defined hereafter.

DETAILED DESCRIPTION OF THE INVENTION

25 As already indicated, the present invention relates to a composition for treating human skin and nails in which a cosmetically acceptable medium is used which contains from 0.1-10% by weight of an ampholyte terpolymer having a weight average molecular weight of from about 10 thousand to 10 million, comprising (a) from at least 1 to as much as 95 weight percent of a nonionic monomer, (b) from at least 5 to as much as 80 weight percent of a cationic monomer, and (c) from at least 1 to as much as 75 weight percent of an anionic monomer.

30 Components of the Ampholyte Terpolymers

Turning to each of the components of the ampholyte terpolymer in turn, the nonionic monomer comprises from 1 to 3 members independently selected from the group consisting of the following monomers and derivatives thereof:

35	acrylamide (AM)	vinylacetate (VA)
	N-alkylacrylamide (NAAM)	vinyl alcohol (VOH)
40	N-vinylpyrrolidinone (VP)	acrylate esters
	methacrylamide (MAM)	allyl alcohol (AAlc)

45 Derivatives of the above monomers are well known and those are useful in the present invention which provide the various conditioning properties described further herein. For example, N-alkylacrylamide and methacrylamide may be regarded as derivatives of acrylamide, and these together with other known derivatives of acrylamide are suitable and preferred for use in the ampholyte terpolymers of the present invention, and may be represented by the following general

formula:



15 where R is H or  $\text{CH}_3$ ; and  $\text{R}^1$  and  $\text{R}^2$  are independently H,  $\text{C}_1\text{--}_4$  alkyl,  $\text{CH}_2\text{OCH}_3$ ,  $\text{CH}_2\text{OCH}_2\text{CH}(\text{CH}_3)_2$ ,  $(\text{CH}_2\text{CH}_2\text{O})_x$ , H, where  $x=1\text{--}50$ , or phenyl, or together are  $\text{C}_3\text{--}_6$  cycloalkyl.

The most preferred acrylamide monomer is the simplest, i.e., that where R, R<sub>1</sub>, and R<sub>2</sub> are all H.

The nonionic monomer portion of the ampholyte terpolymers of the present invention is usually present in an amount of from 1 to 95 weight percent of the total terpolymer. Preferably, this amount is from 5 to 80 weight percent, and most

20 of from 1 to 95 weight percent of the total terpolymer. Preferably, this amount is from 5 to 80 weight percent, and most preferably, this amount is from 10 to 50 weight percent. However, in the case of the monomers N-alkylacrylamide, vinyl acetate, vinyl alcohol, and acrylate esters, solubility problems are created when the proportion of these anionic monomers is at the higher end of the ranges recited above for the overall amphotolytic terpolymer. Thus, the N-alkylacrylamide monomers should be present in amounts of from 1 to 10% by weight; and the vinyl acetate, vinyl alcohol, and acrylate esters monomers should be present in amounts of from 1 to 30% by weight as components of the overall amphotolytic terpolymer.

As will be appreciated by the synthetic polymer chemist, the vinyl alcohol monomer will most conveniently be generated as a monomer simply by hydrolysis of vinyl acetate. Similarly, acrylic acid and methacrylic acid may be conveniently introduced into the terpolymer by hydrolysis of acrylamide and methacrylamide, respectively.

The acrylamide and other nonionic components of the amphotyte terpolymers of the present invention contribute to the film forming capacity of the total terpolymer and thus improve lubricity and feel of the overall terpolymer.

Where the amounts of cationic and anionic components are such that the net charge of the overall terpolymer is near zero, there is a tendency to form water insoluble polysalt complexes. The presence of acrylamide and the other nonionic monomer components serves to enhance the water solubility of the terpolymers in those situations.

It has also been discovered that, surprisingly, when the weight percent of acrylamide and other nonionic monomer components is reduced from about 50 to about 25 weight percent, while the balance of cationic and anionic components stays approximately the same, there is a substantial improvement in the conditioning properties of the terpolymer. Consequently, the most preferred range of weight percents for the acrylamide and other nonionic components is from 10 to 50.

The next component of the ampholyte terpolymers of the present invention is the cationic monomer, e.g., derivatives of diallylamine which are preferred, especially dimethylallylaminium chloride (DMDAAC), which is most preferred.

40 More generally, the cationic monomer comprises 1 or 2 members independently selected from the group consisting of the following monomers and derivatives thereof:

dimethyldiallyl ammonium chloride (DMQAAC).

### dimethylidiallylamine diallylamine (DAA)

### **diallylamine (DAA) methylallyldiallylamine (MDAA)**

45 N,N-dialkylallylammonium chloride (B<sub>1</sub>, B<sub>2</sub> higher than CH<sub>3</sub> in the formula below)

N,N-dimethylallylammonium chloride (DMA) and dimethylaminoethyl(methacrylate (DMAEM))

dimethylaminocetyl methacrylate (DMAEM)  
methacryloyloxyethyl trimethylammonium chloride (METAC)

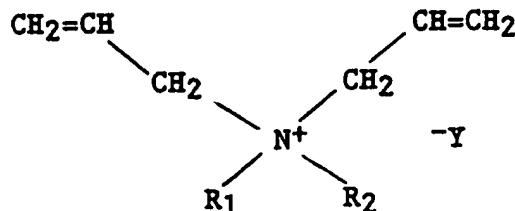
methacryloyloxyethyl trimethylammonium chloride (METAC)

**2-*Acetyl-4-(ethyl trimethylammonium chloride (AETAC))***

52 acryloyoxyethyl trimethylammonium chloride (AE TAC)  
dimethylaminopropylmethacrylamide (DMAEMA)

methacrylamidopropyltrimethylammonium chloride (MAPTAC)

Derivatives of the above cationic monomers are well known and those are useful in the present invention which provide the various conditioning properties described further herein. For example, dimethylidiallylammmonium chloride, methyldiallylamine, and N,N-dialkyldiallylammmonium chloride may be regarded as derivatives of diallylamine, and these together with other known derivatives of diallylamine are suitable and preferred for use in the amphotolytic terpolymers of the present invention, and may be represented by the following general formula:



where  $R_1$  and  $R_2$  are independently H or  $C_{1-12}$ alkyl. The moiety  $\text{Y}^-$  is a suitable anion, such as halide, preferably  $\text{Cl}^-$ , but also including sulfate, and so forth. It is within the skill of the artisan to choose such an anion. The preferred cationic monomer component of the amphotolytic terpolymers of the present invention is dimethyldiallylammonium chloride (DMAAC), i.e., where  $R_1$  and  $R_2$  are  $\text{CH}_3$ .

15 The cationic monomer portion of the amphotolytic terpolymers of the present invention is present in an amount of from 5 to 80 weight percent of the total terpolymer. Preferably, this amount is from 15 to 60 weight percent. However, in the case of the monomers N,N-dialkylallylammonium chloride, i.e., where  $R_1$  and  $R_2$  are alkyl higher than methyl in the formula above, solubility problems are created when the proportion of these cationic monomers is at the higher end of 20 the ranges recited above for the overall amphotolytic terpolymer. Thus, the N,N-dialkylallylammonium chloride monomers should be present in amounts of from 1 to 10% by weight as components of the overall amphotolytic terpolymer.

25 The dimethyldiallylammonium chloride and other cationic monomers contribute to all of the skin and nail conditioning properties. As cationic monomers they possess the inherent substantivity necessary for the overall terpolymer to function. They also provide the basic improvement in moisturizing, lubricity, feel and nail strengthening.

25 The final component of the amphotolytic terpolymers of the present invention is the anionic monomer, e.g., acrylic acid (AA). More generally, the anionic monomer comprises 1 or 2 members independently selected from the group consisting of the following monomers and derivatives thereof:

- acrylic acid (AA)
- methacrylic acid (MAA)
- 30 2-acrylamido-2-methylpropanesulfonic acid (AMPSA)
- crotonic acid (CA)
- sodium vinyl sulfonate (SVS)
- acrylamidoglycolic acid (AGly)
- 2-acrylamido-2-methylbutanoic acid (AMBA)
- 35 2-acrylamido-2-methylpropanephosphonic acid (AMPPA)
- sodium vinyl phosphonate (SVP)
- allyl phosphonic acid (APA)

40 Derivatives of the above anionic monomers are well known and those are useful in the present invention which provide the various conditioning properties described further herein. For example, methacrylic acid may be regarded as a derivative of acrylic acid, and it together with other known derivatives of acrylic acid are suitable and preferred for use in the amphotolytic terpolymers of the present invention, and may be represented by the following general formula:



55 where R is H or  $\text{CH}_3$ ; and  $\text{R}^1$  is  $\text{X}^+$ , H,  $\text{C}_{1-4}$ alkyl,  $\text{CH}_2\text{CH}_2\text{OH}$ ,  $(\text{CH}_2\text{CH}_2\text{O})_x\text{H}$ , where  $x=1-50$ , or phenyl, and  $\text{X}^+$  is a suitable cation forming a salt of the carboxylic acid, such as sodium, potassium, ammonium, monoethanolamine, etc., all of which are well known and within the ordinary skill of the artisan to choose.

The acrylic acid and other anionic monomer components of the amphotolytic terpolymers of the present invention are present in an amount of from 1 to 75 weight percent of the total terpolymer. Preferably, this amount is from 5 to 40 weight percent. However, in the case of the monomers acrylamidoglycolic acid, solubility problems are created when the pro-

portion of these anionic monomers is at the higher end of the ranges recited above for the overall ampholyte terpolymer. Thus, the acrylamidoglycolic acid monomers should be present in amounts of from 1 to 10% by weight as components of the overall ampholyte terpolymer.

5 The acrylic acid and other anionic monomers recited above, along with the acrylamide, contribute to the film forming capacity of the total terpolymer and thus improve moisturizing, lubricity, feel, and nail strengthening. In amounts as little as 1-2 weight percent, the acrylic acid and other anionic monomers measurably improve the compatibility of the overall terpolymer with the anionic surfactant of which a typical cleaning compositions are made. It has also been found that the acrylic acid and other anionic monomers add to the improvement of all of the skin and nail conditioning properties already provided by the cationic component as discussed above. This result is unexpected, and is another indication of 10 the unexpected properties of the ampholyte terpolymers of the present invention.

15 It is possible to selectively optimize one or a subset of the desired conditioning properties described above, by proper proportioning of the nonionic, cationic and anionic components of the ampholyte terpolymers and their molecular weights. This may be a desired course of action responsive to an expression of particular consumer group preference for one or another of these various conditioning properties, depending on the makeup of that particular consumer group.

15

#### Specific Ampholyte Terpolymers

Examples of specific preferred ampholyte terpolymers within the scope of the present invention are the following:

20

25

AM/DMDAAC/AGly	acrylate esters/DMDAAC/AA
AM/DMDAAC/AMBA	AM/DMDAAC/AA/AMPSA/AMPPA
AM/DMDAAC/APA	acrylate esters/DMDAAC/AMBA
AM/DMDAAC/AMPPA	AM/DMDAAC/SVP
AAlc/DMDAAC/AA	

30

Examples of specific more preferred ampholyte terpolymers within the scope of the present invention are the following:

35

40

AM/MDAA/AA	VP/DAA/AA
VP/METAMS/MAA/AA	VP/DMDAAC/AMPSA
MAM/METAMS/MAA	AM/VP/DMDAAC/AMPSA
AM/VP/METAMS/MAA	AM/VP/DMDAAC/AA/AMPSA
AM/VP/METAMS/MAA/AA	AM/DMDAAC/AETAC/AA
VP/AETAC/AA	AM/DMDAAC/DMAEM/AA

45

50

55

Examples of specific most preferred ampholyte terpolymers within the scope of the present invention are the following:

5	AM/DMDAAC/AA AM/DMDAAC/AA/AMPSA AM/DMDAAC/MAA AM/DMDAAC/CA AM/DMDAAC/SVS AM/DAA/AA AM/DAA/MAA AM/DMAEM/AA AM/AETAC/AA AM/METAMS/MAA	AM/DMDAAC/AMPSA AM/MAPTAAC/AMPSA AM/MAPTAAC/AA VP/DMDAAC/AA AM/VP/DMDAAC/AA AM/MAM/DMDAAC/AA AM/NAAM/DMDAAC/AA AM/DAA/AMPSA AM/VAVOH/DMDAAC/AA VP/METAMS/MAA
10		
15		
20		

Within the group of most preferred terpolymers: AM/DMDAAC/AA, AM/DMDAAC/AMPSA, and AM/DMDAAC/AA/AMPSA, certain specific terpolymers having the following compositions with respect to the nonionic, cationic and anionic components, have been found to be particularly useful in the skin and nail conditioning compositions and methods of the present invention:

25

Polymer Composition (Weight Percent)		
AM	DMDAAC	AA
30	50	20
	60	20
	77	16
35	25	50
	25	5
	75	5
40	50	5
	50	40
	50	35
	50	30
45	AM	DMCAAC
	50	22
	50	30
50	15	10 + 10 AA
	50	40
55	60	10
	49	37
	50	40
		14
		10

Molecular Wights

5 The molecular weight of the amphotolytic terpolymers of the present invention may be within the broad range of from about 10 thousand to about 10 million. The molecular weights of most of the specific terpolymers described herein are within the range of about 4 to 8 million. However, it is generally conceded that for polymers used in skin and nail conditioning, molecular weights over about 1 million add little to the effectiveness of those polymers in terms of conditioning properties. At the other end of the scale, polymers with relatively low molecular weights may also be effective in providing skin and nail conditioning properties. The amphotolytic terpolymers of the present invention are also useful in weight average molecular weight ranges below 1 million, and even below 100 thousand, although generally the preferred molecular weight range will be from about 500 thousand to 5 million.

10 Reduced viscosity (dl/g) is used herein as an approximate measure of the weight average molecular weight of the amphotolytic terpolymers of the present invention. Such values represent a capillary viscosity measured with a Ubbelohde Capillary Viscometer at 0.05% concentration of polymer in a 1M NaCl solution, pH 7, at 30°C. The resulting value is calculated in accordance with methods well known in the art.

15

Preparation (Polymerization)

20 The amphotolytic terpolymers of the present invention may be prepared in a straightforward manner by using the process described immediately below.

25 For each terpolymer composition the appropriate weights of aqueous nonionic component, e.g., acrylamide, and cationic component, e.g., DMAA, monomers are charged to a glass reactor equipped with stirring. The volume of anionic component, e.g., acrylic acid, monomer to be added is diluted first with deionized water and then added to the reactor with vigorous stirring to give a total monomer concentration of 14 - 20%. The monomer mixture is adjusted to pH 6.5 with dilute NaOH, heated to 55°C, and purged with nitrogen for at least thirty minutes. Polymerization is initiated by adding  $5 \times 10^{-2}$  mole% of sodium persulfate and  $2.4 \times 10^{-3}$  mole% of sodium bisulfite. After the peak exotherm is reached, additional dilution water and sodium bisulfite are added to scavenge any residual monomer and to dilute the final product to 4 - 8% polymer solids.

30 As already noted further above, in the case of certain anionic components such as acrylic acid and methacrylic acid may be introduced into the terpolymer by adding the corresponding nonionic components acrylamide and methacrylamide, respectively, and then hydrolyzing these once they are a part of the terpolymer, or in the course of its preparation, to give the desired amount of corresponding anionic component in the terpolymer final product. It has also been mentioned that the nonionic component vinyl alcohol (VOH) is most conveniently prepared by hydrolysis of the corresponding vinyl acetate (VA), so that the latter is the component introduced during polymerization, to be hydrolyzed later to the vinyl alcohol.

35

Cosmetically Acceptable Media

40 The amphotolytic terpolymers of the present invention are used as compositions for treating human skin and nails by incorporating them in a cosmetically acceptable medium in amounts of from 0.1-10% by weight of said terpolymer, and preferably in an amount of from 0.5 to 5% by weight of said terpolymer.

45 These compositions can be presented in various forms, i.e., various cosmetically acceptable media, such as a liquid, cream, emulsion, gel, thickening lotion or powder; they can contain water and also any cosmetically acceptable solvent, in particular monoalcohols, such as alkanols having 1 to 8 carbon atoms, like ethanol, isopropanol, benzyl alcohol and phenylethyl alcohol, polyalcohols, such as alkylene glycols, like glycerine, ethylene glycol and propylene glycol, and glycol ethers, such as mono-, di- and tri-ethylene glycol monoalkyl ethers, for example ethylene glycol monomethyl ether, ethylene glycol monomethyl ether and diethylene glycol monomethyl ether, used singly or in a mixture. These solvents can be present in proportions of up to as much as 70% by weight, relative to the weight of the total composition.

50 These compositions can also be packaged as an aerosol, in which case they can be applied either in the form of an aerosol spray or in the form of an aerosol foam.

55 As the propellant gas for these aerosols, it is possible to use, in particular, dimethyl ether, carbon dioxide, nitrogen, nitrous oxide and volatile hydrocarbons, such as butane, isobutane, propane and, possibly, chlorinated and fluorinated hydrocarbons, although the latter are falling into increasing environmental disfavor.

Preferred compositions can also contain electrolytes, such as aluminum chloride hydrate, alkali metal salts, e. g., sodium, potassium or lithium salts, these salts preferably being halides, such as the chloride or bromide, and the sulphate, or salts with organic acids, such as the acetates or lactates, and also alkaline earth metal salts, preferably the carbonates, silicates, nitrates, acetates, gluconates, pantothenates and lactates of calcium, magnesium and strontium.

These compositions can also be presented in the form of a powder or of lyophilisates to be diluted before use.

The compositions according to the present invention can contain any other ingredient normally used in cosmetics, such as perfumes, dyestuffs which can serve to color the composition itself or the skin and/or nails, preservatives,

sequestering agents, thickeners, silicones, softeners, foam synergistic agents, foam stabilisers, sun filters, peptising agents and also anionic, non-ionic, cationic or amphoteric surface-active agents or mixtures thereof. A list of the surface-active agents which can be used according to the present invention is given in US 4,240,450; 4,445,521; and 4,719,099.

If the compositions are presented in the form of a thickened lotion or a gel, they contain thickeners in the presence or absence of a solvent. The thickeners which can be used are especially carbopol, xanthan gums, sodium alginates, gum arabic and cellulose derivatives, and it is also possible to achieve thickening by means of a mixture of polyethylene glycol stearate or distearate or by means of a mixture of a phosphoric acid ester and an amide. The concentration of thickener is suitably 0.05 to 15% by weight.

The pH of the dyeing compositions is generally 7 to 11 and can be adjusted to the desired value by adding an alkalizing agent.

As already mentioned, all alcohols and particularly the monohydric alcohols may be used as ingredients with the amphotolytic terpolymers of the present invention. Alcohols (C<sub>1</sub>-C<sub>24</sub>) which are non-irritating to the skin such as methanol, ethanol, isopropanol, propyl, lauryl, myristyl, cetyl, and stearyl, as well as mixtures thereof, may be used. Polyols such as glycerine, or ethylene glycol or propylene glycol may be utilized advantageously with the amphotolytic terpolymers of the present invention. The choice of the alcohol to be utilized with the particular terpolymer of the present invention will ordinarily be dictated by product aesthetics and the physical form of the composition. For instance, where liquid compositions are desired, the lower alcohols are preferably utilized, while solid or cream compositions within the scope of the present invention will normally require the higher alcohols. Where the skin and nail care formulations of the present invention contain ingredients other than the amphotolytic terpolymer or the alcohol in substantial amounts, the choice of the particular alcohol becomes less important. For example, if the skin and nail care product is to be an abrasive hand cleaning product, then a large proportion of the product will be surface active agents and an abrasive, such as pumice or sand, thereby giving wide latitude to the choice of the particular alcohol.

A desirable variable of the present invention is the incorporation of water with the amphotolytic terpolymer of the present invention. A resultant increase in viscosity of the water is noted with no adverse effects on the stability of the product. Thus, water is a highly suitable carrier which may be used as a vehicle for contacting the amphotolytic terpolymer and the skin or nail substrate. The particular weight ratios at which the desirable increase in viscosity occurs for mixtures of the amphotolytic terpolymer and water are respectively from about 1:10,000 to about 1:100. Preferably this ratio is in the range of from about 1:1000 to about 1:5000. Within the aforementioned range, highly viscous skin and nail care compositions are obtained with low solids content. Such compositions are desirable in that they allow compositions such as suntan or body lotions to be formulated in a thickened state, providing greater ease of application.

In the present invention the amphotolytic terpolymer is ordinarily used at a level of about 0.001 gram per square centimeter to about 0.1 gram per square centimeter of the affected substrate.

The moisturizing, lubricating and other conditioning effects of the amphotolytic terpolymers of the present invention may be obtained through using such diverse products as soap bars, dishwashing compositions, douches, hand and body lotions, suntan lotion, cold creams, preshave and after shave products, as well as cleansing or lotion pads and wound dressings, deodorant and antiperspirant products in stick, gel, lotion and aerosol forms, cosmetics including lipstick, rouge, mascara and eye liner, facial bases and powders, wrinkle and spot removing creams and lotions, and the like, and many other skin and nail care products. Listed below are materials which may be included in such skin and nail care products.

Hand and body lotions frequently contain emollients such as stearic acid, glycerol monostearate, mineral oil, glycerine, sesame oil, bees wax, lauryl, myristyl, cetyl or stearyl alcohols, lanolin, lecithin, sterols, isopropylmyristate, as well any other recognized emollients. Emollients are typically used in the compositions of the present invention at levels of from about 1% to about 50% by weight.

Astringents and antiseptics may be incorporated into the compositions of the present invention. A preferred astringent material is zinc phenolsulfonate. The foregoing material exhibits not only astringent but also antiseptic qualities and is of particular use in preshave formulations to stiffen the beard. Humectants such as propylene glycol are also desirable ingredients for inclusion in skin and nail care products to prevent drying of the skin. Allantoin is included in such compositions for its soothing and healing effects upon injured skin.

The soap bar and dishwashing compositions of the present invention may contain all manner of anionic, nonionic, zwitterionic, amphoteric or cationic surfactants. Typically the surfactant will be present at from about 1% to about 70%, preferably about 3% to 35% by weight.

Most preferably, the dishwashing compositions of the present invention contain anionic surfactants which, for example, include alkylether sulfates, olefin sulfonates, alkyl and alkenyl sulfates, alkyl sulfonates, and alkylbenzene sulfonates. A particularly useful discovery is that the amphotolytic terpolymer, when used with a surface active agent, enhances and prolongs suds life. Consumers using dishwashing products often tend to overuse the composition when the suds disappear from the surface of the dishpan. Thus, in the surfactant formulations of the present invention, the presence of the amphotolytic terpolymer maintains the suds level, thus avoiding inadvertent overuse of the product by the consumer.

The soap bars of the present invention may either contain real soap, combinations of soap and synthetic surfactants, or may be formulated solely with synthetic surfactants, such as alkylbenzene sulfonates. For a more detailed disclosure

of components which are ordinarily found either as surfactants or additives in dishwashing compositions, see US 3,963,649.

EXAMPLES OF PREFERRED EMBODIMENTS

5

The following examples demonstrate skin conditioning improvement results which can be obtained with specific ampholyte terpolymers of the present invention, but are not intended to in any way limit the scope of the present invention.

10

EXAMPLE 1

Each ampholyte terpolymer is evaluated sequentially for feel during use, feel during rinse off and feel after application. Performance is evaluated by independent observers on coded samples using ratings of 0 to 4 (poor to excellent).

15

Each ampholyte terpolymer (1 wt %) is blended with a commercial product and evaluated by feel. One hand of each observer is treated with 1 gram of commercial liquid soap and at the same time the other hand of each observer is treated with 1 gram of commercial product plus 1 wt % polymer. Simultaneously, the observers rate the feel of the products. For liquid soaps, the feel during wash, during rinse, and after treatment are evaluated. For hand lotions, both hands of each observer are treated with each formulation and compared to its previously evaluated untreated commercial hand lotion. The feel during application and after application is evaluated using again a rating of 0 to 4 (poor to excellent).

20

In addition to feel, moisture vapor transmission rates (MVTR) are determined; 3 mil films on laboratory paper toweling are prepared with the ampholyte terpolymers. Each film is attached to a glass container holding a desiccant, anhydrous  $\text{CaCl}_2$ , and placed in 92 to 96% RH at 86°F. The MVTR results indicate a high rate of water vapor transmission.

25

The percent pickup of air moisture is also determined for the ampholyte terpolymers. A 2.2 mil film of terpolymer on laboratory paper toweling will pick up a certain percentage of moisture at 86° F., 92 to 96% relative humidity in 24 hours. The laboratory paper, by itself, will have essentially no pickup of air moisture. The polymer film will have a soft, smooth feel both dry and after moisture pickup. This data indicates that the ampholyte terpolymers of the present invention function as humectants.

The following ampholyte terpolymers, when evaluated in accordance with the assays and tests described above, will be found to give good to excellent results:

30

Polymer Composition (Weight Percent)		
AM	DMAAC	AA
50	20	30
60	20	20
77	16	7
25	50	25
40	25	70
	75	5
	50	20
45	50	45
	50	10
	50	15
	50	20
AM	DMAAC	AMPSA
50	22	28
50	30	10 + 10 AA
50	15	35
50	40	10
55	60	10
	49	14
	50	10

The following examples illustrate various cosmetically acceptable media for preparing skin and nail care compositons using the ampholyte terpolymers of the present invention. In those Examples, the following terpolymer abbreviations are used:

5 Polyampholyte A:

By weight: 25% Acrylamide  
50% DMAAAC  
25% Acrylic Acid

10

Polyampholyte B:

15

By weight: 50% Acrylamide  
25% DMAAAC  
35% AMPSA

Polyampholyte C:

20

By weight: 50% N-Vinylpyrrolidinone  
40% DMAAAC  
10% Acrylic Acid

EXAMPLE 2

25 After Shave

30

WT. %	INGREDIENT
47.5%	SDA 40 Alcohol
3.0%	Propylene Glycol
0.5%	Polyampholyte A
48.0%	H <sub>2</sub> O
1.0%	Fragrance

35

The addition of the polyampholyte to this formula will leave the skin with a soft silky feeling during application and a soft moist feeling after dry-down. Substantially, the same results will be obtained if the terpolymer concentration is 40 varied between 0.1% and 5.0%.

45

50

55

## EXAMPLE 3

## Sunscreen

5

10

15

20

25

30

35

WT. %	INGREDIENT
5.00	Octyl Dimethyl PABA
5.00	Octyl Methoxycinnamate
4.00	Glyceryl Stearate
4.00	Sorbitan Sesquioleate
4.00	Lanolin
3.00	C12-15 Alcohols Benzoate
3.0	Cocoa Butter
0.5	Jojoba Oil
0.5	Benzyl Alcohol
0.5	Dimethicone
2.0	Stearic Acid
0.1	Carbomer-941
62.3	Water
1.40	Polyampholyte B
0.10	Disodium EDTA
0.50	Triethanolamine
4.0	Sorbitol
0.1	Tocopheryl Acetate

Adding the polyampholyte to this formula will improve the feel of the product and provide a softer feeling to the skin after application.

## EXAMPLE 4

## Hand Lotion

45

50

55

WT. %	INGREDIENT
7.00	Stearic Acid
0.50	C12-15 Alcohols Benzoate
0.50	Sorbitan Oleate
2.50	Polysorbate-60
10.0	Sorbitol
1.50	Polyampholyte C
78.00	Water

The polyampholyte will provide a soft, smooth feel to the dry skin. Similar results can be expected at polyampholyte concentrations of 0.2 to 10.0%.

EXAMPLE 5

Liquid Hand Soap

5

10

15

20

WT. %	INGREDIENT
65.09	H <sub>2</sub> O
22.0	Sodium C14-16 Olefin Sulfonate
3.0	Cocamidopropyl Betaine
3.0	Lauramide DEA
0.53	Chloroxylenol
0.13	Tetrasodium EDTA
2.00	Sodium Chloride
0.25	Citric Acid
4.00	Polyampholyte A

The polyampholyte in this product will provide a richer feeling liquid soap and lather, and after rinsing, the skin will be noticeably softer and smoother. Similar properties will be obtained using polyampholyte concentrations of 0.1 to 10.0%.

25

EXAMPLE 6

30

35

40

WT. %	INGREDIENT
2.00	Water
10.00	Propylene Glycol
1.00	Polyampholyte B
69.00	PPG-3 Myristyl Ether
10.00	Mineral Oil
8.00	Sodium Stearate

The polyampholyte in this product will result in better skin feel after use. Similar results will be obtained using 0.1 to 10% polyampholyte.

45

50

55

## EXAMPLE 7

## Brushless Shaving Cream

5

10

15

20

The polyampholyte will provide a creamier product with more slip and leave the skin feeling softer. Similar results will be obtained at polyampholyte concentrations of 0.3 to 7.5%.

## Claims

25

1. A composition for treating human skin and nails in which a cosmetically acceptable medium is used which contains from 0.1-10% by weight of a water-soluble amphotolyte terpolymer having a weight average molecular weight of from about 10 thousand to 10 million, comprising:

30

(a) from at least 1 to as much as 95 weight percent of a nonionic monomer comprising from 1 to 3 members independently selected from the group consisting of the following monomers and derivatives thereof:

35

acrylamide (AM)	vinylacetate (VA)
N-alkylacrylamide (NAAM)	vinyl alcohol (VOH)
N-vinylpyrrolidinone (VP)	acrylate esters
methacrylamide (MAM)	allyl alcohol (AAlc)

40

(b) from at least 5 to as much as 80 weight percent of a cationic monomer comprising 1 or 2 members independently selected from the group consisting of the following monomers and derivatives thereof:

dimethyldiallylammonium chloride (DMAAC)

diallylamine (DAA)

methyldiallylamine (MDAA)

N,N-diallyldiallylammonium chloride

dimethylaminoethylmethacrylate (DMAEM)

methacyloyloxyethyl trimethylammonium chloride (METAC)

methacyloyloxyethyl trimethylammonium methyl sulfate (METAMS)

acryloyloxyethyl trimethylammonium chloride (AETAC)

dimethylaminopropylmethacrylamide (DMAPMA)

methacrylamidopropyl trimethylammonium chloride (MAPTAC)

and

(c) from at least 1 to as much as 75 weight percent of an anionic monomer comprising 1 or 2 members independently selected from the group consisting of the following monomers and derivatives thereof:

acrylic acid (AA)

methacrylic acid (MAA)

2-acrylamido-2-methylpropanesulfonic acid (AMPSA)

crotonic acid (CA)

sodium vinyl sulfonat (SVS)  
acrylamidoglycolic acid (AGly)  
2-acrylamido-2-methylbutanoic acid (AMBA)  
2-acrylamido-2-methylpropanephosphonic acid (AMPPA)  
sodium vinyl phosphonate (SVP)  
allyl phosphonic acid (APA).

10 2. A composition according to Claim 1 wherein the weight percent of the nonionic component is from 10 to 80, the weight percent of the cationic component is from 15 to 60, and the weight percent of the anionic component is from 5 to 40.

3. A composition according to Claim 1 wherein the ampholyte terpolymer is a member selected from the group consisting of:

15	AM/DMDAAC/AGly	acrylate esters/DMDAAC/AA
	AM/DMDAAC/AMBA	AM/DMDAAC/AA/AMPSA/AMPPA
	AM/DMDAAC/APA	acrylate esters/DMDAAC/AMBA
20	AM/DMDAAC/AMPPA	AM/DMDAAC/SVP
	AAIc/DMDAAC/AA	
	AM/MDAA/AA	VP/DAA/AA
25	VP/METAMS/MAA/AA	VP/DMDAAC/AMPSA
	MAM/METAMS/MAA	AM/VP/DMDAAC/AMPSA
	AM/VP/METAMS/MAA	AM/VP/DMDAAC/AA/AMPSA
30	AM/VP/METAMS/MAA/AA	AM/DMDAAC/AETAC/AA
	VP/AETAC/AA	AM/DMDAAC/DMAEM/AA
	AM/DMDAAC/AA	AM/DMDAAC/AMPSA
	AM/DMDAAC/AA/AMPSA	AM/MAPTAC/AMPSA
35	AM/DMDAAC/MAA	AM/MAPTAC/AA
	AM/DMDAAC/CA	VP/DMDAAC/AA
	AM/DMDAAC/SVS	AM/VP/DMDAAC/AA
40	AM/DAA/AA	AM/MAM/DMDAAC/AA
	AM/DAA/MAA	AM/NAAM/DMDAAC/AA
	AM/DMAEM/AA	AM/DAA/AMPSA
	AM/AETAC/AA	AM/VA/VOH/DMDAAC/AA
45	AM/METAMS/MAA	VP/METAMS/MAA

4. A composition according to Claim 3 wherein the ampholyte terpolymer is a member selected from the group consisting of

5

Polymer Composition (Weight Percent)		
AM	DMDAAC	AA
50	20	30
60	20	20
77	16	7
25	50	25
25	5	70
15	75	5
50	5	45
50	40	10
20	50	15
50	30	20
AM	DMCAAC	AMPSA
50	22	28
25	30	10 + 10 AA
50	15	35
50	40	10
30	60	10
49	37	14
50	40	10

10

15

20

25

30

45

50

55

35 5. A composition according to Claim 1 wherein the cosmetically acceptable medium is a member selected from the group consisting of after shave, sunscreen, hand lotion, liquid hand soap, bath oil bar, brushless shaving cream, and dishwashing liquid.

40 6. A method of treating human skin and nails which comprises applying to said skin and nails a cosmetically acceptable medium containing from 0.1-10% by weight of a water-soluble ampholyte terpolymer having a weight average molecular weight of from about 10 thousand to 10 million, comprising:

(a) from at least 1 to as much as 95 weight percent of a nonionic monomer comprising from 1 to 3 members independently selected from the group consisting of the following monomers and derivatives thereof:

acrylamide (AM)	vinylacetate (VA)
N-alkylacrylamide (NAAM)	vinyl alcohol (VOH)
N-vinylpyrrolidinone (VP)	acrylate esters
methacrylamide (MAM)	allyl alcohol (AAlc)

(b) from at least 5 to as much as 80 weight percent of a cationic monomer comprising 1 or 2 members independently selected from the group consisting of the following monomers and derivatives thereof:

dimethyldiallylammonium chloride (DMDAAC)

diallylamine (DAA)

methyldiallylamine (MDAA)

N,N-dialkylallylammonium chloride

dimethylaminoethylmethacrylate (DMAEM)  
 methacryloyloxyethyl trimethylammonium chloride (METAC)  
 methacryloyloxyethyl trimethylammonium methyl sulfate (METAMS)  
 acryloyloxyethyl trimethylammonium chloride (AETAC)  
 5 dimethylaminopropylmethacrylamide (DMAPMA)  
 methacrylamidopropyl trimethylammonium chloride (MAPTAC)  
 and  
 (c) from at least 1 to as much as 75 weight percent of an anionic monomer comprising 1 or 2 members independently selected from the group consisting of the following monomers and derivatives thereof:  
 10 acrylic acid (AA)  
 methacrylic acid (MAA)  
 2-acrylamido-2-methylpropanesulfonic acid (AMPSA)  
 crotonic acid (CA)  
 sodium vinyl sulfonate (SVS)  
 15 acrylamidoglycolic acid (AGly)  
 2-acrylamido-2-methylbutanoic acid (AMBA)  
 2-acrylamido-2-methylpropanephosphonic acid (AMPPA)  
 sodium vinyl phosphonate (SVP)  
 allyl phosphonic acid (APA).

20 7. A method according to Claim 6 wherein the weight percent of the nonionic component is from 10 to 80, the weight percent of the cationic component is from 15 to 60, and the weight percent of the anionic component is from 5 to 40.

8. A method according to Claim 6 wherein the ampholyte terpolymer is a member selected from the group consisting of:  
 25

30	AM/DMAAC/AGly AM/DMAAC/AMBA AM/DMAAC/APA AM/DMAAC/AMPPA AAlc/DMAAC/AA	acrylate esters/DMAAC/AA AM/DMAAC/AA/AMPSA/AMPPA acrylate esters/DMAAC/AMBA AM/DMAAC/SVP
35	AM/MDAA/AA VP/METAMS/MAA/AA MAM/METAMS/MAA AM/VP/METAMS/MAA	VP/DAA/AA VP/DMAAC/AMPSA AM/VP/DMAAC/AMPSA AM/VP/DMAAC/AA/AMPSA
40	AM/VP/METAMS/MAA/AA VP/AETAC/AA AM/DMAAC/AA	AM/DMAAC/AETAC/AA AM/DMAAC/DMAEM/AA AM/DMAAC/AMPSA
45	AM/DMAAC/AA/AMPSA AM/DMAAC/MAA AM/DMAAC/CA AM/DMAAC/SVS	AM/MAPTAC/AMPSA AM/MAPTAC/AA VP/DMAAC/AA AM/VP/DMAAC/AA
50	AM/DAA/AA AM/DAA/MAA AM/DMAEM/AA AM/AETAC/AA	AM/MAM/DMAAC/AA AM/NAAM/DMAAC/AA AM/DAA/AMPSA AM/VA/VOH/DMAAC/AA
55	AM/METAMS/MAA	VP/METAMS/MAA

9. A method according to Claim 8 wherein the ampholyte terpolymer is a member selected from the group consisting of:

Polymer Composition (Weight Percent)		
AM	DMAAC	AA
50	20	30
60	20	20
10	77	16
25	50	25
25	5	70
15	75	5
50	5	45
50	40	10
20	50	35
50	30	20
AM	DMCAAC	AMPSA
50	22	28
25	50	10 + 10 AA
50	15	35
50	40	10
30	60	10
49	37	14
50	40	10

10. A method according to Claim 6 wherein the cosmetically acceptable medium is a member selected from the group consisting of after shave, sunscreen, hand lotion, liquid hand soap, bath oil bar, brushless shaving cream, and dishwashing liquid.

#### Patentansprüche

11. 1. Zusammensetzung zur Behandlung menschlicher Haut und Nägel, wobei ein kosmetisch verträgliches Medium verwendet wird, das 0,1 bis 10 Gew.% wasserlösliches Ampholyt-Terpolymer mit einer massege mittelten Molekülmasse von etwa 10 Tausend bis 10 Millionen enthält, umfassend:

(a) mindestens 1 bis zu 95 Gew.% nichtionisches Monomer, umfassend 1 bis 3 Stoffe, unabhängig voneinander ausgewählt aus der Gruppe mit folgenden Monomeren und ihren Derivaten:

Acrylamid (AM)	Vinylacetat (VA)
N-Alkylacrylamid (NAAM)	Vinylalkohol (VOH)
N-Vinylpyrrolidinon (VP)	Acrylatester
Methacrylamid (MAM)	Allylalkohol (AAlc)

(b) mindestens 5 bis zu 80 Gew.% kationisches Monomer, umfassend 1 oder 2 Stoffe, unabhängig voneinander ausgewählt aus der Gruppe mit folgenden Monomeren und ihren Derivaten:  
 Dimethyldiallylammoniumchlorid (DMAAC)  
 Diallylamin (DAA)  
 Methylidiallylamin (MDAA)

N, N-Dialkyldiallylammoniumchlorid  
 Dimethylaminoethylmethacrylat (DMAEM)  
 Methacloyloxyethyltrimethylammoniumchlorid (METAC)  
 Methacloyloxyethyltrimethylammoniummethylsulfat (METAMS)  
 5 Acryloyloxyethyltrimethylammoniumchlorid (AETAC)  
 Dimethylaminopropylmethacrylamid (DMAPMA)  
 Methacrylamidopropyltrimethylammoniumchlorid (MAPTAC)  
 und  
 10 (c) mindestens 1 bis zu 75 Gew.% anionisches Monomer, umfassend 1 oder 2 Stoffe, unabhängig voneinander ausgewählt aus der Gruppe mit folgenden Monomeren und ihren Derivaten:  
 Acrylsäure (AA)  
 Methacrylsäure (MAA)  
 15 2-Acrylamido-2-methylpropansulfonsäure (AMPSA)  
 Crotonsäure (CA)  
 Natriumvinylsulfonat (SVS)  
 Acrylamidoglycolsäure (AGly)  
 20 2-Acrylamido-2-methylbuttersäure (AMBA)  
 2-Acrylamido-2-methylpropanphosphonsäure (AMPPA)  
 Natriumvinylphosphonat (SVP)  
 Allylphosphonsäure (APA).

2. Zusammensetzung nach Anspruch 1, wobei der nicht-ionische Bestandteil 10 bis 80 Gew.%, der kationische Bestandteil 15 bis 60 Gew.% und der anionische Bestandteil 5 bis 40 Gew.% ausmacht.  
 25 3. Zusammensetzung nach Anspruch 1, wobei das Ampholyt-Terpolymer ein Stoff ist, ausgewählt aus der Gruppe, mit:

30	AM/DMDAAC/AGly AM/DMDAAC/AMBA AM/DMDAAC/APA AM/DMDAAC/AMPPA AAIc/DMDAAC/AA	Acrylatester/DMDAAC/AA AM/DMDAAC/AA/AMPSA/AMPPA Acrylatester/DMDAAC/AMBA AM/DMDAAC/SVP VP/DAA/AA
35	AM/MDAA/AA VP/METAMS/MAA/AA MAM/METAMS/MAA	VP/DMDAAC/AMPSA AM/VP/DMDAAC/AMPSA
40	AM/VP/METAMS/MAA AM/VP/METAMS/MAA/AA VP/AETAC/AA	AM/VP/DMDAAC/AA/AMPSA AM/DMDAAC/AETAC/AA AM/DMDAAC/DMAEM/AA
45	AM/DMDAAC/AA AM/DMDAAC/AA/AMPSA AM/DMDAAC/MAA AM/DMDAAC/CA	AM/DMDAAC/AMPSA AM/MAPTAC/AMPSA AM/MAPTAC/AA VP/DMDAAC/AA
50	AM/DMDAAC/SVS AM/DAA/AA AM/DAA/MAA	AM/VP/DMDAAC/AA AM/MAM/DMDAAC/AA AM/NAAM/DMDAAC/AA
55	AM/DMAEM/AA AM/AETAC/AA AM/METAMS/MAA	AM/DAA/AMPSA AM/V/VOH/DMDAAC/AA VP/METAMS/MAA

4. Zusammensetzung nach Anspruch 3, wobei das Ampholyt-Terpolymer ein Stoff ist, ausgewählt aus der Gruppe, mit:

Polymer-Zusammensetzung (Gew.%)			
	AM	DMAAC	AA
5	50	20	30
	60	20	20
10	77	16	7
	25	50	25
	25	5	70
	75	5	20
15	50	5	45
	50	40	10
	50	35	15
20	50	30	20
	AM	DMAAC	AMPSA
	50	22	28
25	50	30	10 + 10 AA
	50	15	35
	50	40	10
	60	30	10
30	49	37	14
	50	40	10

5. Zusammensetzung nach Anspruch 1, wobei das kosmetisch verträgliche Medium ein Stoff ist, ausgewählt aus der Gruppe mit After Shave, Sonnenschutz, Handlotion, flüssige Handseife, Badeöl-Kern, pinselfreie Rasiercreme und Geschirrspülflüssigkeit.

35

6. Verfahren zur Behandlung menschlicher Haut und Nägel, umfassend die Anwendung auf Haut und Nägel eines kosmetisch verträglichen Mediums, das 0,1 bis 10 Gew.% wasserlösliches Ampholyt-Terpolymer mit einer massegemittelten Molekulmasse von etwa 10 Tausend bis 10 Millionen enthält, umfassend:

40

(a) mindestens 1 bis zu 95 Gew.% nichtionisches Monomer, umfassend 1 bis 3 Stoffe, unabhängig voneinander ausgewählt aus der Gruppe mit folgenden Monomeren und ihren Derivaten:

45

Acrylamid (AM) Vinylacetat (VA)  
N-Alkylacrylamid (NAAM) Vinylalkohol (VOH)  
N-Vinylpyrrolidinon (VP) Acrylatester  
Methacrylamid (MAM) Allylalkohol (AAc)

50

(b) mindestens 5 bis zu 80 Gew.% kationisches Monomer, umfassend 1 oder 2 Stoffe, unabhängig voneinander ausgewählt aus der Gruppe mit folgenden Monomeren und ihren Derivaten:

55

Dimethyldiallylammoniumchlorid (DMAAC)  
Diallylamin (DAA)  
Methyldiallylamin (MDAA)  
N,N-Dialkylallylammoniumchlorid  
Dimethylaminoethylmethacrylat (DMAEM)  
Methacyloyloxyethyltrimethylammoniumchlorid (METAC)  
Methacyloyloxyethyltrimethylammoniummethylsulfat (METAMS)  
Acryloyloxyethyltrimethylammoniumchlorid (AETAC)  
Dimethylaminopropylmethacrylamid (DMAPMA)



9. Verfahren nach Anspruch 8, wobei das Ampholyt-Terpolymer ein Stoff ist, ausgewählt aus der Gruppe, mit:

Polymer-Zusammensetzung (Gew.%)			
	AM	DMAAC	AA
5	50	20	30
	60	20	20
10	77	16	7
	25	50	25
	25	5	70
15	75	5	20
	50	5	45
	50	40	10
20	50	35	15
	50	30	20
	AM	DMAAC	AMPSA
25	50	22	28
	50	30	10 + 10 AA
	50	15	35
	50	40	10
30	60	30	10
	49	37	14
	50	40	10

10. Verfahren nach Anspruch 6, wobei das kosmetisch verträgliche Medium ein Stoff ist, ausgewählt aus der Gruppe mit After Shave, Sonnenschutz, Handlotion, flüssige Handseife, Badeöl-Kern, pinselreie Rasiercreme und Geschirrspülflüssigkeit.

#### Revendications

40 1. Composition pour traiter la peau et les ongles humains, dans laquelle on utilise un milieu cosmétiquement acceptable qui contient de 0,1 à 10% en poids d'un terpolymère ampholyte hydrosoluble ayant une masse moléculaire moyenne en poids d'environ 10 mille à 10 millions, comprenant:

45 (a) d'au moins 1 jusqu'à 95 pourcent en poids d'un monomère non ionique comprenant de 1 à 3 éléments indépendamment choisis dans le groupe formé par les monomères suivants et leurs dérivés:

	Acrylamide (AM)	Acétate de vinyle (VA)
50	N-alkylacrylamide (NAAM)	Alcool vinylique (VOH)
	N-vinylpyrrolidinone (VP)	Esters acrylate
	Méthacrylamide (MAM)	Alcool allylique (AAlc)

55 (b) d'au moins 5 jusqu'à 80 pourcent en poids d'un monomère cationique comprenant 1 ou 2 éléments indépendamment choisis dans le groupe formé par les monomères suivants et leurs dérivés:  
 le chlorure de diméthylallylammonium (DMDAAC),  
 la diallylamine (DAA),  
 la méthylallylamine (MDAA),

le chlorure de N,N-dialkyldiallylammonium,  
le méthacrylate de diméthylaminoéthyle (DMAEM),  
le chlorure de méthacryloyoxyéthyltriméthylammonium (METAC),  
le méthylsulfate de méthacryloyoxyéthyltriméthylammonium (METAMS),  
le chlorure d'acryloyoxyéthyltriméthylammonium (AETAC),  
l diméthylaminopropylméthacrylamide (DMAPMA),  
le chlorure de méthacrylamidopropyltriméthylammonium (MAPTAC).  
et  
5 (c) d'au moins 1 jusqu'à 75 pourcent en poids d'un monomère anionique comprenant 1 ou 2 éléments indépendamment choisis dans le groupe formé par les monomères suivants et leurs dérivés:  
l'acide acrylique (AA)  
l'acide méthacrylique (MAA)  
l'acide 2-acrylamido-2-méthylpropanesulfonique (AMPSA)  
l'acide crotonique (CA)  
10 le vinylsulfonate de sodium (SVS)  
l'acide acrylamidoglycolique (AGly)  
l'acide 2-acrylamido-2-méthylbutanoïque (AMBA)  
l'acide 2-acrylamido-2-méthylpropanephosphonique (AMPPA)  
le vinylsulfonate de sodium (SVP)  
15 l'acide allylphosphonique (APA).

20 2. Composition selon la revendication 1, dans laquelle le pourcentage en poids du composant non ionique est compris entre 10 et 80, le pourcentage en poids du composant cationique est compris entre 15 et 60, et le pourcentage en poids du composant anionique est compris entre 5 et 40.

25

30

35

40

45

50

55

3. Composition selon la revendication 1, dans laquelle le terpolymère ampholyte est un élément choisi dans le groupe formé par:

5	AM/DMDAAC/AGly	esters acrylate/DMDAAC/AA
	AM/DMDAAC/AMBA	AM/DMDAAC/AA/AMPSA/AMPPA
	AM/DMDAAC/APA	esters acrylate/DMDAAC/AMBA
10	AM/DMDAAC/AMPPA	AM/DMDAAC/SVP
	AAlc/DMDAAC/AA	
	AM/MDAA/AA	VP/DAA/AA
	VP/METAMS/MAA/AA	VP/DMDAAC/AMPSA
15	MAM/METAMS/MAA	AM/VP/DMDAAC/AMPSA
	AM/VP/METAMS/MAA	AM/VP/DMDAAC/AA/AMPSA
	AM/VP/METAMS/MAA/AA	AM/DMDAAC/AETAC/AA
20	VP/AETAC/AA	AM/DMDAAC/DMAEM/AA
	AM/DMDAAC/AA	AM/DMDAAC/AMPSA
	AM/DMDAAC/AA/AMPSA	AM/MAPTAC/AMPSA
	AM/DMDAAC/MAA	AM/MAPTAC/AA
25	AM/DMDAAC/CA	VP/DMDAAC/AA
	AM/DMDAAC/SVS	AM/VP/DMDAAC/AA
	AM/DAA/AA	AM/MAM/DMDAAC/AA
30	AM/DAA/MAA	AM/NAAM/DMDAAC/AA
	AM/DMAEM/AA	AM/DAA/AMPSA
	AM/AETAC/AA	AM/V/A/VOH/DMDAAC/AA
	AM/METAMS/MAA	VP/METAMS/MAA

35

40

45

50

55

4. Composition selon la revendication 3, dans laquelle le terpolymère ampholyte est un élément choisi dans le groupe formé par:

Composition polymère (pourcent en poids)			
	AM	DMAAC	
		AA	
5	50	20	30
10	60	20	20
	77	16	7
15	25	50	25
	25	5	70
20	75	5	20
	50	5	45
	50	40	10
25	50	35	15
	50	30	20
	AM	DMCAAC	AMPSA
	50	22	28
30	50	30	10 + 10 AA
	50	15	35
	50	40	10
	60	30	10
	49	37	14
	50	40	10

35 5. Composition selon la revendication 1, dans laquelle le milieu cosmétiquement acceptable est un élément choisi dans le groupe formé par un après-rasage, une crème solaire, une lotion pour les mains, un savon liquide pour les mains, un pain d'huile de bain, une crème de rasage sans blaireau et un liquide de lavage de vaisselle.

40 6. Procédé pour traiter la peau et les ongles humains qui consiste à appliquer à ladite peau et auxdits ongles un milieu cosmétiquement acceptable contenant de 0,1 à 10% en poids d'un terpolymère ampholyte hydrosoluble ayant une masse moléculaire moyenne en poids comprise entre environ 10 mille et 10 millions, comprenant:

(a) d'au moins 1 jusqu'à 95 pourcent en poids d'un monomère non ionique comprenant de 1 à 3 éléments indépendamment choisis dans le groupe formé par les monomères suivants et leurs dérivés:

45	Acrylamide (AM)	Acétate de vinyle (VA)
50	N-alkylacrylamide (NAAM)	Alcool vinylique (VOH)
	N-vinylpyrrolidinone (VP)	Esters acrylate
	Méthacrylamide (MAM)	Alcool allylique (AAlc)

55 (b) d'au moins 5 jusqu'à 80 pourcent en poids d'un monomère cationique comprenant 1 ou 2 éléments indépendamment choisis dans le groupe formé par les monomères suivants et leurs dérivés:  
 le chlorure de diméthylallylammonium (DMDAAC),  
 la diallylamine (DAA),  
 la méthylallylamine (MDAA),  
 le chlorure de N,N-diallylallylammonium,

le méthacrylate de diméthylaminoéthyle (DMAEM),  
 le chlorure de méthacryloyoxyéthyltriméthylammonium (METAC),  
 le méthylsulfate de méthacryloyoxyéthyltriméthylammonium (METAMS),  
 le chlorure d'acryloyoxyéthyltriméthylammonium (AETAC),  
 le diméthylaminopropylméthacrylamide (DMAPMA),  
 le chlorure de méthacrylamidopropyltriméthylammonium (MAPTAC),  
 et  
 (c) d'au moins 1 jusqu'à 75 pourcent en poids d'un monomère anionique comprenant 1 ou 2 éléments indépendamment choisis dans le groupe formé par les monomères suivants et leurs dérivés:  
 10 l'acide acrylique (AA)  
 l'acide méthacrylique (MAA)  
 l'acide 2-acrylamido-2-méthylpropanesulfonique (AMPSA)  
 l'acide crotonique (CA)  
 le vinylsulfonate de sodium (SVS)  
 15 l'acide acrylamidoglycolique (AGly)  
 l'acide 2-acrylamido-2-méthylbutanoïque (AMBA)  
 l'acide 2-acrylamido-2-méthylpropanephosphonique (AMPPA)  
 le vinylsulfonate de sodium (SVP)  
 l'acide allylphosphonique (APA).  
 20

7. Procédé selon la revendication 6, dans lequel le pourcentage en poids du composant non ionique est compris entre 10 et 80, le pourcentage en poids du composant cationique est compris entre 15 et 60, et le pourcentage en poids du composant anionique est compris entre 5 et 40.

25 8. Procédé selon la revendication 6, dans lequel le terpolymère ampholyte est un élément choisi dans le groupe formé par:

30	AM/DMDAAC/AGly	esters acrylate/DMDAAC/AA
	AM/DMDAAC/AMBA	AM/DMDAAC/AA/AMPSA/AMPPA
	AM/DMDAAC/APA	esters acrylate/DMDAAC/AMBA
	AM/DMDAAC/AMPPA	AM/DMDAAC/SVP
35	AAc/DMDAAC/AA	
	AM/MDAA/AA	VP/DAA/AA
	VP/METAMS/MAA/AA	VP/DMDAAC/AMPSA
40	MAM/METAMS/MAA	AM/VP/DMDAAC/AMPSA
	AM/VP/METAMS/MAA	AM/VP/DMDAAC/AA/AMPSA
	AM/VP/METAMS/MAA/AA	AM/DMDAAC/AETAC/AA
	VP/AETAC/AA	AM/DMDAAC/DMAEM/AA
45	AM/DMDAAC/AA	AM/DMDAAC/AMPSA
	AM/DMDAAC/AA/AMPSA	AM/MAPTAC/AMPSA
	AM/DMDAAC/MAA	AM/MAPTAC/AA
50	AM/DMDAAC/CA	VP/DMDAAC/AA
	AM/DMDAAC/SVS	AM/VP/DMDAAC/AA
	AM/DAA/AA	AM/MAM/DMDAAC/AA
	AM/DAA/MAA	AM/NAAM/DMDAAC/AA
55	AM/DMAEM/AA	AM/DAA/AMPSA
	AM/AETAC/AA	AM/V/V/OH/DMDAAC/AA
	AM/METAMS/MAA	VP/METAMS/MAA

9. Procédé selon la revendication 8, dans lequel le terpolymère ampholyte est un élément choisi dans le groupe formé par:

Composition polymère (pourcent en poids)			
	AM	DMAAC	
		AA	
10	50	20	30
	60	20	20
	77	16	7
	25	50	25
	25	5	70
	75	5	20
15	50	5	45
	50	40	10
	50	35	15
	50	30	20
	AM	DMCAC	AMPSA
	50	22	28
20	50	30	10 + 10 AA
	50	15	35
	50	40	10
	60	30	10
	49	37	14
	50	40	10

35 10. Procédé selon la revendication 6, dans lequel le milieu cosmétiquement acceptable est un élément choisi dans le groupe formé par un après-rasage, une crème solaire, une lotion pour les mains, un savon liquide pour les mains, un pain d'huile de bain, une crème de rasage sans blaireau et un liquide de lavage de vaisselle.

40

45

50

55